CLAIMS

What is claimed is:

1. A testing device for a battery and vehicle system circuit, comprising:

a system tester;

load leads connectable at respective first ends to separated points of the vehicle system circuit and connectable at respective second ends to a first set of inputs to the tester;

sense leads connectable at respective first ends to the separated points of the vehicle system circuit and connectable at respective second ends to a second set of inputs to the tester;

a controller for measuring the impedance between the circuit points and calculating data related thereto; and

display means for displaying in real time the impedance, conductance or admittance as measured and for displaying a parameter based on the related data calculated by the controller.

2. A testing device as recited in claim 1, wherein a load circuit element is connected across the load leads, and the system tester further comprises an electrical source connectable to the load circuit element.

3. A testing device as recited in claim 2, wherein the electrical source is an alternating current source and the tester further comprises:

a current sense amplifier connected to the load leads;

a dc voltage amplifier and an ac amplifier connected to the sense leads, each of the amplifiers connected to a respective input channel of an analog to digital converter.

4. A testing device as recited in claim 3, wherein the analog to digital converter output is applied to the controller.

5. A testing device as recited in claim 1, wherein the system tester comprises:

means for calculating impedance values for a plurality of circuit points at which the load leads and sense leads may be connected; and

means for comparing the calculated impedance values with respective threshold values.

6. A testing device as recited in claim 1, wherein said load leads and sense leads provide Kelvin connections at points of the vehicle system circuit under test, and further comprising means for extending the length of the load lead and the sense lead connectable to a circuit point under test.

7. A testing device as recited in claim 1, further comprising a pair of conductors attached at a first end to a Kelvin clamp, the pair of conductors attached at a second end to respective terminals of a terminal block, the terminals being insulated from each other, wherein the terminal block is configured for mating to a Kelvin clamp of the system tester.

8. A method for testing a vehicle system circuit comprising the steps of:

taking a first measurement of the value of impedance between two separated points of the vehicle system circuit;

storing the measured impedance value in a controller as a reference value in response to a user entered input;

taking a second measurement of the value of impedance in the vehicle system circuit;

offsetting the second measured impedance value by the value loaded in the controller to obtain a difference impedance value; and

displaying impedance, conductance, or admittance representative of the difference impedance value.

9. A method as recited in claim 8, further comprising the steps of:

calculating a value of available cranking current based on one of the measured impedance values; and

displaying the available cranking current value.

10. A method as recited in claim 8, wherein the second measurement is taken at different circuit points from the circuit points at which the first measurement is taken.

11. A method as recited in claim 8, wherein the second measurement is taken at the same circuit points at which the first measurement is taken and both measurements are taken under different operating conditions.

12. A method for testing a vehicle system circuit comprising the steps of:

storing an impedance reference value in a tester controller;

measuring the value of impedance between two separated points of the vehicle system circuit;

determining whether to modify the measured value of impedance for display; and

in response to the step of determining, displaying the measured value of impedance if the outcome of the determining step is negative, or displaying an impedance value in which the measured value of impedance is offset by the stored impedance reference value if the outcome of the determining step is positive.

13. A method as recited in claim 12, wherein the determining step is responsive to the presence or absence of a user input to the controller.

14. A method as recited in claim 12, the storing step comprises loading a measured impedance value as the reference impedance value.

15. A method as recited in claim 14, further comprising the steps of:

taking a second measurement of the value of impedance in the vehicle system circuit; and

repeating the steps of determining and displaying; and

wherein the stored measured value is the first measured impedance value.

16. A method as recited in claim 15, wherein the second measurement is taken at different circuit points from the circuit points at which the first measurement is taken.

17. A method as recited in claim 15, wherein the second measurement is taken at the same circuit points at which the first measurement is taken and both measurements are taken under different operating conditions.

18. An automated method for testing an electrical circuit of a vehicle, the method comprising the steps of:

a) verifying that good lead connections have been made at two separated points of the electrical circuit;

b) calculating impedance between the circuit points;

c) displaying the measured impedance;

d) determining whether additional testing is to be performed;

e) in response to a positive outcome in the determining step storing the measured impedance obtained in the calculating step;

f) repeating steps a) through e) until it is determined that no additional testing is to be performed;

g) comparing all measured values stored in the previous steps with respective threshold values; and

h) display results obtained in the comparing step.

19. A method as recited in claim 18, wherein the step of determining comprises prompting a user for preference as to further testing and responding to a user input.

20. A method as recited in claim 18, wherein each additional test is made at different circuit points from the circuit points at which previous testing was performed.

21. A method as recited in claim 20, wherein an initial test is performed with leads connected to the terminals of a battery.

22. A method as recited in claim 20, wherein the battery is tested under load.

23. A method as recited in claim 20 wherein a battery charger is connected across the battery terminals and the initial test is performed during a battery charging operation.

24. A method as recited in claim 21, wherein any of the additional test measurements are made with a lead connected to any element of the electrical circuit.

25. A method as recited in claim 20, wherein addition tests are performed with a lead connected, respectively, to an alternator and a starter.

26. A method as recited in claim 18, wherein the threshold values are pre-established for electrical system.

27. A method as recited in claim 18, wherein the threshold values are user entered values.

28. A method as recited in claim 18, wherein impedance values are displayed continuously.

29. In a testing device including a system tester, load leads connectable at respective first ends to separated points of the vehicle system circuit and connectable at respective second ends to a first set of inputs to the tester, sense leads connectable at respective first ends to the separated points of the vehicle system circuit and connectable at respective second ends to a second set of inputs to the tester, the leads being coupled to the points by Kelvin connections, the improvement comprising:

a pair of conductors attached at a first end to a Kelvin clamp, the pair of conductors attached at a second end to respective terminals of a terminal block, the terminals being insulated from each other, wherein the terminal block is configured for mating to a Kelvin clamp of the testing device.